



A white paper on:

## America Needs to Become Spacefaring

- **Space is an important 21<sup>st</sup> century frontier**
- **Today, America is the leader in space, but this leadership is being lost**
- **To retain this leadership—and the economic and security benefits that go with it—America must become a true spacefaring nation**
- **How? By building a commercial-based, integrated space infrastructure throughout the Earth-Moon system**
  - **To reestablish American scientific and industrial leadership**
  - **To grow and strengthen American jobs using math and science**
  - **To enable Americans and American enterprises to safely and routinely operate in space**

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“... the nation will have to be a spacefaring nation to be the global leader in the 21<sup>st</sup> century...”

—Aerospace Commission, 2002

“In this new century, those who effectively utilize space will enjoy added prosperity and security and will hold a substantial advantage over those who do not.”

—U.S. National Space Policy, 2006

**Introduction**

In 2002, Congress chartered the *Commission on the Future of the United States Aerospace Industry* to identify steps America should take to strengthen the nation’s critical aerospace industry. In assessing America’s future in space, the commission drew the important conclusion that: “... **the nation will have to be a spacefaring nation to be the global leader in the 21<sup>st</sup> century—our freedom, mobility, and quality of life depend on it.**” [Emphasis added]

These important findings were recently reiterated in the 2006 U.S. National Space Policy. “In this new century, **those who effectively utilize space will enjoy added prosperity and security and will hold a substantial advantage over those who do not.** ... In order to increase knowledge, discovery, economic prosperity, and enhance the national security, **the United States must have robust, effective, and efficient space capabilities.**” [Emphasis added]

**What does spacefaring mean?**

In the 19<sup>th</sup> century, America became a seafaring nation. We developed mastery of sea operations enabling the U.S. to design and build ocean-going ships, to successfully conduct ocean-crossing commerce, and to use the oceans for national security. In the 20<sup>th</sup> century, America became an “airfaring” nation with the mastery of air operations necessary to design and build aircraft, to successfully conduct global air operations, and to use airpower as a critical element of national security.

In the 21<sup>st</sup> century, America needs to become a true spacefaring nation by becoming masters of space operations. Once America becomes spacefaring, Americans will be able to safely and routinely access and operate in space to conduct the new and expanded space enterprises necessary to, in the

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words of the aerospace commission, “exploit space to assure national and planetary security, economic benefit, and scientific discovery.”

### **America’s near-future challenge**

Today, America is not a true spacefaring nation. We do not have mastery of space operations and, as a consequence, do not have robust, effective, and efficient space capabilities. Specifically, Americans do not have the means to routinely and safely access space, move within space, and operate within space—prerequisites for being able to tap the potential of space to increase national prosperity and security.

**America’s near-future challenge in space is to establish the capabilities necessary to safely and routinely operate in space.**

### **Developing mastery to open new frontiers**

At the outset of the 19<sup>th</sup> century, shortly after the purchase of the Louisiana Territory, President Thomas Jefferson predicted that the settlement of the new western American territories would take one thousand years because getting around in America was so difficult. Yet, just one year after Lewis and Clark returned from their three-year epic journey to the Pacific Coast, American ingenuity reshaped the future of transportation in America. Building on the technological and entrepreneurial genius of Robert Fulton, John Stevens, Robert Livingston, and Nicolas Roosevelt, among others, Americans successfully applied steam power to build the steamboat lines and railroads that opened America’s new frontier to settlement and industrialization.

**What America unexpectedly benefited from, in the opening decades of the 19<sup>th</sup> century, was that building new infrastructure, based on steam power, also created a mastery of steam power operations** that transformed a

coastal agricultural nation of five million in 1800 into a robust, industrial, continental nation of seventy million by 1900. And, equally important, **this mastery came about through a rapidly growing middle-class of merchants, skilled workers, technical professionals, risk takers, and industrial venture capitalists** who applied this new expertise and experience to create new businesses, grow the nation’s economy, and prepare America for the new challenges and possibilities of the 20<sup>th</sup> century.

### **Turning point in space**

At the beginning of the 21<sup>st</sup> century, America faces similar challenges and opportunities in space. Just as opening the western territories and the frontier of flight were essential to America’s growth, prosperity, and security back then, opening the space frontier is now recognized as essential to our nation’s growth, prosperity, and security in the 21<sup>st</sup> century.

**Hence, America is at a turning point with respect to opening the space frontier. How should we respond?** Do we stay the course in space, focusing on limited space operations—bunched together with other nations content in terms of what we are able to accomplish in space? Or do we harness America’s tremendous potential of technology and industry to become the first true spacefaring nation and be best positioned to tap the benefits of space to increase national prosperity and security?

### **Spacefaring benefits**

In an increasingly competitive world, America needs to take advantage of all new opportunities to grow and prosper. In particular, America needs to take actions that strengthen the middle-class by creating new career-long jobs that benefit from education, expertise, and skills emphasizing math and science. The path to becoming spacefaring is such an opportunity that will provide benefits such as:

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- **Regaining world leadership in space technologies and operations**

America is a technological society, benefiting immensely from scientific and technological advances. All industrial nations seek these benefits. Throughout most of the latter half of the 20<sup>th</sup> century—by virtue of its technological and industrial innovation in such areas as aerospace, communications, computers, automotive, and medicine—America became a world leader. **By establishing the ability to operate safely and routinely in space, America will reestablish leadership in space technologies and operations.**

- **Creating new demands for solid middle-class jobs all across the country**

Achieving technological and industrial leadership requires substantial investment in both physical and human resources. Hence, designing, developing, building, and operating the new space infrastructure will not only require investments in new plants and facilities, it will require new generations of scientists, engineers, technicians, and skilled workers from across the country.

Unlike most infrastructure programs which are local—building new roads, dams, airports, etc.—building the systems and facilities that will comprise the terrestrial and space-based elements of the space infrastructure must be a national enterprise. Through the Internet and related communication capabilities, Americans and American companies across the nation will be able to participate in this new national endeavor. Further, American students—especially down into the middle school years—will see the value of studying and doing well in the more challenging subjects of math and science. Not only will this provide future employees for growing commercial and governmental spacefaring enterprises, it will also stimulate the supply of needed workers

for other high-tech industries that also depend on workers competent in math and science to remain competitive in the 21st century.

- **Placing Americans in the primary position to benefit first from the potential of space**

The value of building infrastructure to encourage economic development is well understood by cities and states. New businesses rely on local and state governments to build the roads, waterlines, telecommunications, etc., that are needed before the businesses can begin operation. And, as any business student understands, in most economic ventures, the first to reach the market with new goods and services captures new customers, establishes product loyalty, creates significant technological leadership in terms of patents and intellectual expertise, opens the door to additional services, and best positions itself for continued growth. Space services and products will be no different. By virtue of being the first to create an integrated space infrastructure, American businesses and entrepreneurs will have the advantage in establishing successful new space enterprises.

One particularly important example could be the building of Space Solar Power satellites to beam environmentally-benign electrical power to the surface in lieu of building new coal, oil, and nuclear power plants to meet the world's growing demand for electrical energy. American companies could become a world-leading supplier of space electricity in a market valued in hundreds of billions of dollars annually. Not only could this help, should it prove technologically feasible, to counter the impact of burning fossil fuels—a significant world science and political concern—but it would also significantly increase American exports, helping to balance America's large trade deficit while creating sustainable new industries with products in demand by the rest of the world.

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### **Initial space infrastructure elements**

The initial space infrastructure necessary to enable robust, effective, and efficient American space operations will include these elements:

- “Aircraft-like” safe and routine, fully-reusable space access for passengers and cargo.
- A shuttle-derived, expendable, unmanned space launch system to transport heavy and oversize payloads to low Earth orbit (LEO).
- Permanent space bases in LEO to serve as the destination of the reusable space access systems, to provide a habitable transfer node for space operations personnel, and to provide a base of operations for on-orbit space operations and services.
- LEO-based, fully-reusable spacecraft to provide “aircraft-like” safe and routine transport of passengers and cargo throughout the Earth-Moon system.
- In-space support services, throughout the Earth-Moon system, for assembly, testing, inspection, repair, maintenance, upgrades, and replenishment.

### **Leveraging today’s technologies**

These initial space infrastructure elements are representative of what American industry has the capability to design and develop today. In other words, it’s not about generating more reports and studies, but about designing, producing, deploying, and applying new spacefaring capabilities.

It is important to recognize that these new national investments will be made in industrial capabilities developed domestically by current and new American companies from across the nation. Building these new capabilities will require efforts appropriate to small, medium, and large companies. It

is expected that many new businesses will be created to both provide the new logistics capabilities as well as make use of the new infrastructure.

### **Summary**

Over the past two centuries, America has invested heavily in building the new infrastructure necessary to enable economic growth, strengthen national security, and foster scientific and technological advances. We have done this through building canals, railroads, highways, bridges, dams, airports, electrical power generation networks, oil and gas distribution networks, telegraph and telephone networks, the internet, the global positioning system—the list is almost endless. America is a technological nation built on a solid foundation of efficient and effective infrastructure.

To be a world leader in the 21<sup>st</sup> century, America must be a true spacefaring nation with robust, effective, and efficient space capabilities. Repeatedly, during the last 200 years, America has responded to similar frontier-opening challenges by building new infrastructure and mastering operations in new frontiers that translate into economic growth and world leadership. (The Internet was the most recent example.) **The next, best step forward in space for America is to build an integrated space infrastructure that will lead to a true spacefaring America. This is the challenge and opportunity confronting America as we move forward into the 21<sup>st</sup> century.**

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“No longer will we tread only the Earth of our ancestors—for spacefarers we will become.”

—Mike Snead